Bell Work
8-Sept-2017

For example if you weigh out gold jewelry to sell for extra cash and the scale being used reads to the decigram (XXX.Xg) and you record 28.4g at a price of $43.3/ gram, how much money should you get?

What if the actual weight was 28.44g, were you shorted?

Objective

You will be able to round number based on significant figure rules.

Significant figures

There are 2 kinds of numbers:

Exact: the amount of money in your account. Known with certainty. Anything *COUNTED*

Approximate: weight, height—anything **Measured**. No measurement is perfect.

Recall

A. Exact numbers are obtained by
    1. using a measuring tool
    2. counting
    3. definition

B. Measured numbers are obtained by
    1. using a measuring tool
    2. counting
    3. definition

Practice

Classify each of the following as an exact or a measured number.

1 yard = 3 feet

The diameter of a red blood cell is 6×10^{-4} cm.

There are 6 hats on the shelf.

Gold melts at 1064°C.

When to use Sig Figs

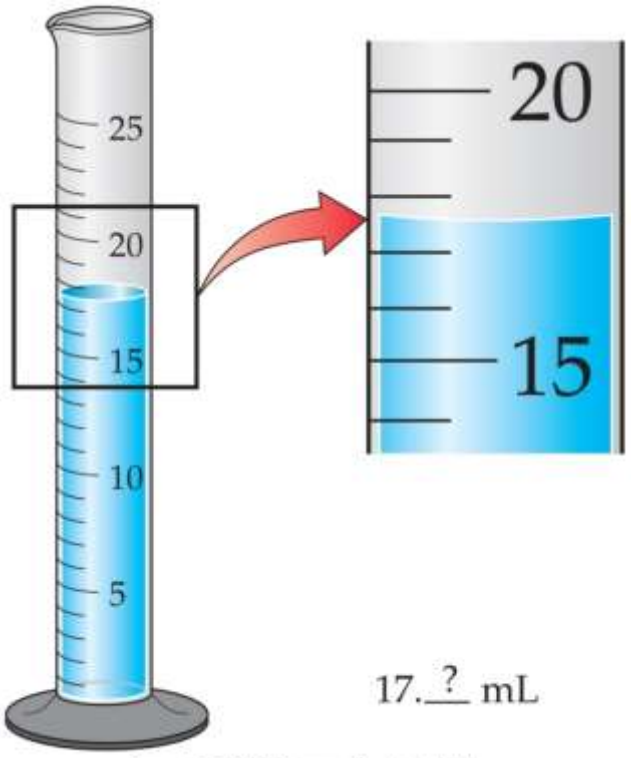
When a measurement is recorded only those digits that are **dependable** are written down.

Every experimental measurement has a degree of uncertainty.

The volume, V, at right is certain in the 10's place, 10mL<V<20mL

The 1's digit is also certain, 17mL<V<18mL

A best guess is needed for the tenths place.



Another Example

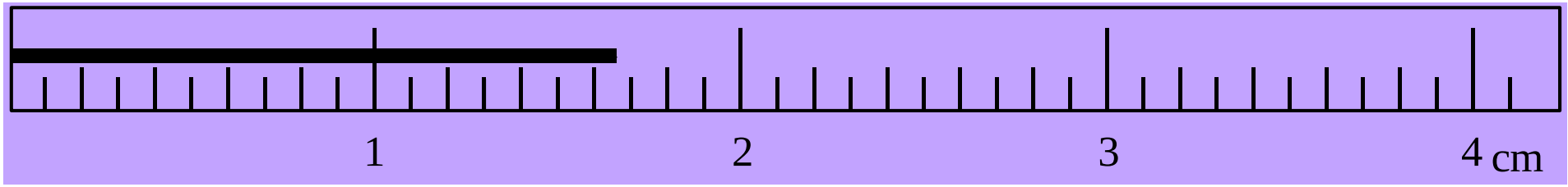
We can see the markings between 1.6-1.7cm

We can't see the markings between the 0.6-0.7

We must guess between 0.6 & 0.7

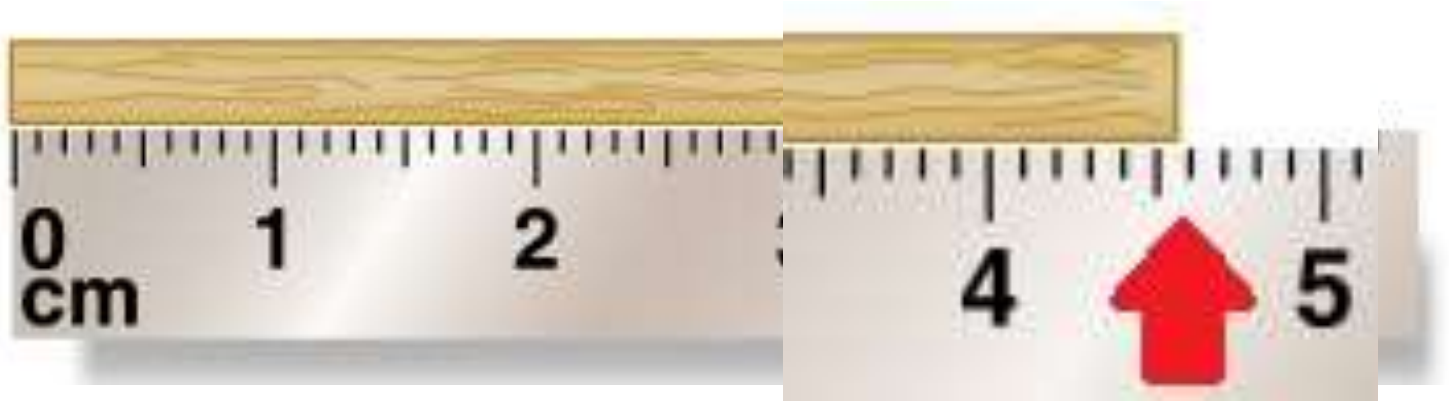
We record 1.67 cm as our measurement

The last digit an 7 was our guess...stop there



Your Turn

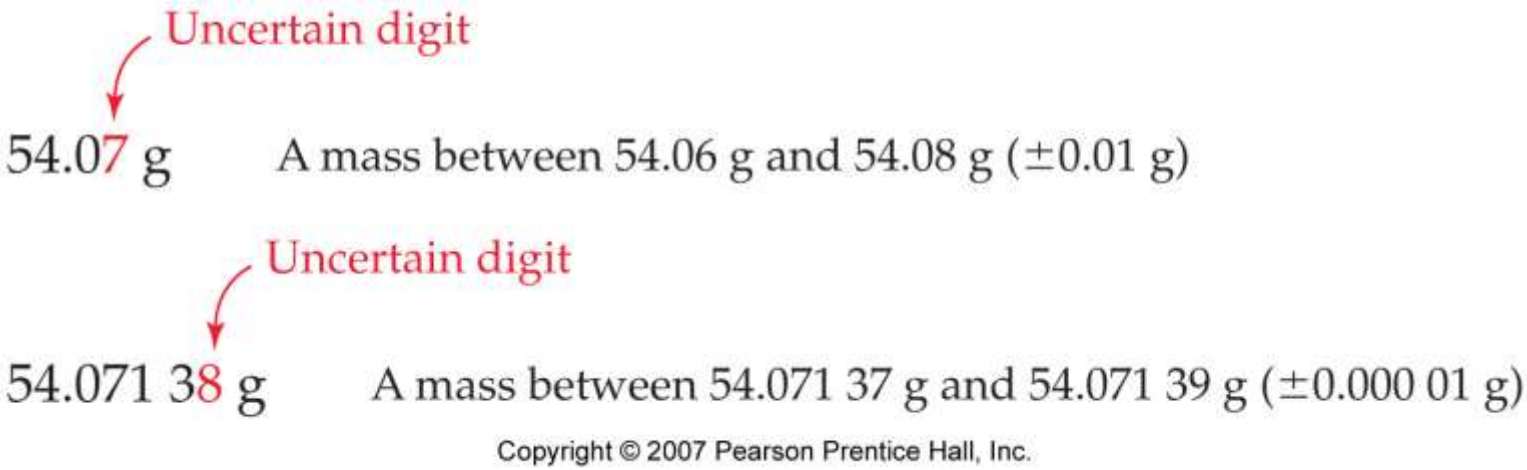
Measured Numbers have error…you have to make that Guess!



What is the length of the wooden stick?

1) 4.5 cm
2) 4.54 cm
3) 4.547 cm

Recorded Numbers



All but one of the significant figures are known with certainty. The last sig. fig. is only to the best possible estimate.

To indicate the precision of a measurement, the value recorded should use all the digits known with certainty.

The Rules

RULE 1. Zeros in the middle of a number are like any other digit; they are always significant.

Ex. 45.081 g has five significant figures.

RULE 2. Zeros at the beginning of a number are *not* significant; they act only to locate the decimal point.

Ex. 0.0537 cm has three significant figures, and 0.069 01 mL has? **4**

The Rules cont.

RULE 3. Zeros at the end of a number and *after* the decimal point are significant. It is assumed that these zeros would not be shown unless they were significant.

Ex. 527.700 m has six significant figures.

If the value were known to only four significant figures, we would write 527.7 m.

The Rules cont.

RULE 4. Zeros at the end of a number and *before* an implied decimal point may or may not be significant. We cannot tell whether they are part of the measurement or whether they act only to locate the unwritten but implied decimal point.

Ex. 280 000km has 2 sig. figs.

How Many Sig Figs?

a. 45.8736

b. 0.000239

c. 0.00023900

d. 48000.

e. 48000

f. 3.982×10^6

g. 1.00040

Scientific Notation

When ever you are unsure – convert to scientific notation

$$215. = 2.15 \times 10^2$$

Decimal point is moved two places to the left, so exponent is 2.

$$3.7962 \times 10^4 = 37{,}962$$

Positive exponent of 4, so decimal point is moved to the right four places.

$$1.56 \times 10^{-8} = 0.000\,000\,015\,6$$

Negative exponent of –8, so decimal point is moved to the left eight places.

Practice

1. Indicate how many significant figures there are in each of the following measured values.

246.32	5 sig figs	1.008	4 sig figs	700000	1 sig fig
107.854	6 sig figs	0.00340	3 sig figs	350.670	6 sig figs
100.3	4 sig figs	14.600	5 sig figs	1.0000	5 sig figs
0.678	3 sig figs	0.0001	1 sig fig	320001	6 sig figs

2. Calculate the answers to the appropriate number of significant figures.

32.567	246.24	658.0
135.0	238.278	23.5478
+ 1.4567	+ 98.3	+ 1345.29
169.0	**582.8**	**2026.8**

3. Calculate the answers to the appropriate number of significant figures.

a) 23.7 x 3.8	= **90.**	e) 43.678 x 64.1	= **2.80×10^3**
b) 45.76 x 0.25	= **11**	f) 1.678 / 0.42	= **4.0**
c) 81.04 g x0.010	= **0.81**	g) 28.367 / 3.74	= **7.58**
d) 6.47 x 64.5	= **417**	h) 4278 / 1.006	= **4252**

Adding and Subtracting

Rule: When adding or subtracting measured numbers, the answer can have no more places after the decimal than the **Least** of the measured numbers.

Practice

5.45cm + 2.3cm = 7.75cm,

Round off to = 7.8cm

You try:

7.432cm + 2cm =

9.432 round to → 9cm

Multiplications and Division

Rule: When multiplying or dividing, the result can have no more significant figures than the **least** reliable measurement.

Practice

56.78 cm x 2.45cm = 139.111 cm^2

Round to → 139cm^2

75.8cm x 9.6cm = ?

Home Work 8Sept17: Pre Lab Density

Use as many piece of paper as you need, try not to write on both side.

Analysis and conclusions should be recorded at the end of the pre lab after the lab